A New Tool in the Battle Against Wildfires

Introduction

During the 2000 fire season, more than 122,000 wildfires burned more than 8.4 million acres of public and private lands, resulting in property loss, resource damage and disruption of community services, according to the National Interagency Fire Center. The daily cost of fire suppression efforts was more than $15 million. The wildfires began early in the year, migrating northward from New Mexico to Montana. Experts believe that 2000 was not an exceptional year for wildfires, but rather the beginning a new pattern: the western United States can expect ravaging wildfires to continue to destroy thousands of acres of land and to endanger human life.

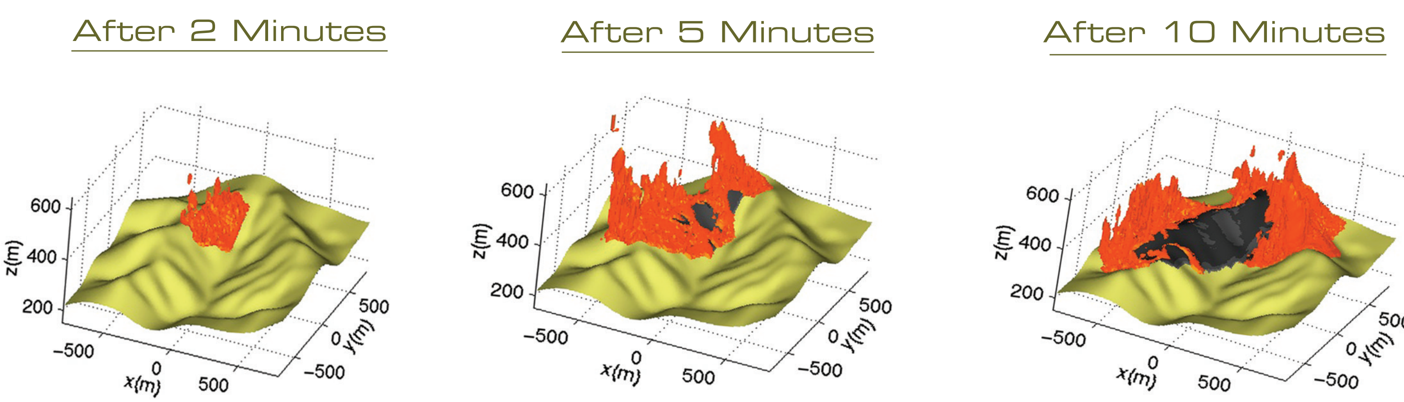
The National Interagency Fire Center further estimates that as of Oct. 1, 2001, this year's fires have burned 3,229,179 acres. Across the country some areas have had more active seasons than others. For example, Alaska and the Southwest combined have recorded less than 300,000 acres of land burned in wildfires. Other states, including Florida, Nevada, Washington, and Oregon, have experienced more active seasons than normal, accounting for more than half (nearly 1.6 million of the 3.2 million) of acres burned nationwide.

A Helpful Tool

In response to the threat of continuing wildfires, Lawrence Livermore National Laboratory with Los Alamos National Laboratory have been working on a Wildfire Behavior Prediction Initiative. The national resource would combine and leverage components of a multi-year wildfire model effort at LANL and the existing capabilities of the National Atmospheric Release Advisory Center at LLNL to predict the behavior of wildfires and prescribed burns. A unique feature of the models is their ability to predict the weather, fire behavior and the interaction between the two. Unlike conventional models that use empirical results from laboratory experiments, the new

(Page 2, Over)

Tunnel Canyon Fire:



This is a wildfire simulation, using reconstructed weather for 11 a.m. PDT October 20, 1991 over Tunnel Canyon (near the Caldecott Tunnel) — the time and place where the tragic Oakland hills wildfire started.

For this preliminary simulation, LLNL used fuel data from a high-resolution inventory taken in 1993 — two years after the actual fire; however, the weather is for the day of the fire. These figures show contour surfaces for the simulated termperature of 330 degrees Celsius at two, five and 10 minutes. The contour surfaces resemble flames. The team will soon begin simulations using fuel/vegetation data collected before the 1991 fire.

(Continued From Page 1)

models use a complete physical representation of fire and weather processes.

The researchers have already developed wildfire models and the LANL team has accurately simulated the behavior of two historic fires — the 1994 South Canyon wildfire in Colorado, which claimed the lives of 14 firefighters, and the 1996 Corral Canyon wildfire near Calabassas, Calif., in which a firefighter was severely burned. The simulation results can be viewed in animated video sequences. For both cases the models successfully reproduced the unexpected (and devastating) progression of the fires,

The LLNL team is currently coupling the fire model with a regional weather prediction model and doing weather/fire simulations to reconstruct the early stage of the tragic 1991 Oakland hills fire in the San Francisco Bay Area. That fire, which claimed 25 lives and destroyed more than 3,000 dwellings, will provide yet another test of the modeling system's accuracy.

Follow-up studies will look at the behavior of hypothetical fires in nearby canyons that escaped the 1991 fire. These latter simulations have been requested by local emergency management and planning officials to improve their preparedness for future wildfires.

Goal

The program's main objective would be to save lives and property. The project would provide around-the-clock guidance to fire managers to help them safely and effectively use their limited firefighting resources.

Even before a real-time prediction capability becomes available, the system could contribute to three other key areas of wildfire management — short-term planning (such as scheduling prescribed burns and assessing potential fire threats), long-term planning (such as case studies, long-term forest management, and community planning), and simulation-based firefighter training.

Funding

To date, LLNL has secured $446,000 in Laboratory-Directed Research and Development funds for two years worth of research

Scientists estimate the project would cost approximately $25 million during the next five years to develop a fully operational national program.

Status

After receiving major funding, the project could be functioning in real time within one to two years for prescribed burns and be fully operational in three to five years to respond to wildfires

Scientists say the project has the potential to help move the nation into a new era of scientifically based wildfire and vegetation management. They envision laptop computers on fire trucks linked to a national center where scientists would use weather, fuel and terrain conditions along with the models to predict wildfire behavior. Eventually, the models could even predict the effects of firefighting activities, helping managers to choose the safest and most effective techniques for specific fires.

The National Center for Atmospheric Research (NCAR) has recently joined the LLNL and LANL team.

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